

Cardiac axis in the screening of congenital heart defects in the first trimester

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Objective

Evaluate the utility of the cardiac axis as marker of cardiac heart defects.

Methods

Prospective observational study between 2012 y2016 in Hospital Universitario Fundación Jiménez Díaz. We included 2946single euploid gestations without congenital heart disease that came to perform the first trimester ultrasound between November 2012 and January 2016. Multiple gestations are excluded and those whose postnatal control was not complete. Ultrasound was performed according to ISUOG protocol, it was measured CRL, TN and ductus venous flow following FMF protocols. Cardiac axis was evaluated following criteria published by Comstock in 1989 and Shinkovskaya in 2010 (The angle formed by a line dividing the thorax into 2 halves from vertebral body to sternum and another line at the level of the Interventricular septum at plane level of 4 chambers view). In those cases of difficult evaluation, the color Doppler was used to improve the quality of the image.

Results

Prevalence of major congenital heart disease in our population is 0.56%, of them 64% are presented in euploides fetuses (pulmonary Atresia: 2, C. Complex: 1, AV Canal: 1, Doble outlet of riht ventricle: 1, TOF: 2, Heteroataxy sd. : 3 and Truncus: 1. Prenatal detection rate is 94% including I, II and III trimester ultrasound. In previus studies we establish normal a cardiac axis of 48.3° with standard desviation 8.7° . If we use deviations of the cardiac axis greater than 1.8 Standard deviations (SD) and perform a ROC curve, we obtain an area under the curve of 0.78. Using 1.5 SD of the cardiac axis (angle $< 35^{\circ}$ and $> 61^{\circ}$) the Detection rate is: 66.67% (30.31-100), Specificity: 89.55% (88.21-90.57) PPV: 1.37 (0.26-3.87), NPV 99.88% (99.72-100), LHR +: 6.38 (3.97-10.26) and LHR- 0.37% (0.15-0.94). If we define as a high risk population those whom present NT > 3.5 mm and/or DV absent or reverse a wave and we use the cardiac axis as a marker of heart disease in this population, the area under the curve is 0.81 with a detection rate of 100% (91.67-100), VPP 50% (17.54-82.46), VPN 100% (99.12-100), LHR + 10.5 (4.91-22.48). Using this screening model, globally we will maintain the same detection rate (TD: 66.7%) but we decrease by 80% the need of echocardiography in early second trimester.

Conclusion

The inclusion of the cardiac axis as a marker of congenital heart disease in euploid fetuses, allows to maintain the same rate of detection but decreases by 80% echocardiography iinearly second trimester.

Eje cardiaco	Eje Normal	Eje $<35^{\circ}$ ó $>61^{\circ}$	Sens.	VPP
1,5 DS				
Positivo	3/2445	6/291	66.67% (30.31-100)	2.06% (0.26-3.87)
TN	TN ≤ 3.5	TN > 3.5	Sens.	VPP
Positivo	6/2724	3/22	33.5% (0-69.69)	13.64% (0.0-30.25)
DV	DV normal	DV a/r	Sens.	VPP
Positivo	4 /2676	5/ 60	55.56% (17.54-93.57)	8.33% (0.51-16.16)
DV a/r y/o TN > 3.5 mm	Negativo ambos	Positivo alguno de los 2	Sens	VPP
Positivo	3/2667	6/63	66.7% (30.31-100)	8.7% (1.32-16.07)
DV a/r y/o TN > 3.5 mm	Eje Normal 1,5 DS	Eje alterado $> 1,5$ DS	Sens.	VPP
Positivo	0/57	6/12	100% (91.67-100)	50% (17.54-82.46)